

What is claimed is:

1. A system for the measurement of the total organic carbon content (TOC) of a sample of water, comprising:

a. a source of a CO<sub>2</sub>-free oxidant gas;

b. a cell of a material capable of containing a plasma, said cell defining an interior volume for receiving said oxidant gas and said sample, and being provided with at least one inlet and one outlet port;

first and second electrodes disposed on opposite sides of said cell;

a high voltage power supply connected across said first and second electrodes; and

an instrument for measuring the quantity of CO<sub>2</sub> in said cell after exposure of the mixture of said sample and said oxidant to said plasma.

2. The system of claim 1, wherein said instrument for measuring the quantity of CO<sub>2</sub> in said cell is a Fourier-transform infrared (FTIR) spectroscopic instrument.

3. The system of claim 1, wherein said instrument for measuring the quantity of CO<sub>2</sub> in said cell is a non-dispersive infrared (NDIR) instrument.

4. The system of claim 1, wherein said instrument for measuring the quantity of CO<sub>2</sub> in said cell measures the conductivity of a quantity of water in which the CO<sub>2</sub> produced by oxidation of the TOC is dissolved.

5. The system of claim 1, wherein said cell comprises first and second inlet ports, whereby said oxidant gas is admitted via one inlet port and said sample via the other, whereby said oxidant and said sample are not mixed until both are within said cell.

6. The system of claim 5, wherein said first and second inlet ports comprise coaxial tubes.

7. The system of claim 1, wherein said cell defines opposed pairs of parallel, elongated side walls, one pair of opposed walls being substantially wider than the other, so as to define a flat, elongated interior volume.

8. The system of claim 7, wherein said electrodes are disposed on opposed wider walls of said cell.

9. The system of claim 8, wherein said electrodes are sealed to the walls of said cell in gas tight fashion.

10. The system of claim 1, wherein said cell is fabricated of glass or quartz.

11. The system of claim 1, wherein said cell and said instrument for measuring the quantity of CO<sub>2</sub> in said cell are connected in a loop.

12. The system of claim 11, wherein said instrument comprises means for monitoring the quantity of CO<sub>2</sub> in said cell over time, in order to determine when all of the carbon in said sample has been oxidized to CO<sub>2</sub> in said cell.

13. The system of claim 11, wherein said loop comprises a condenser.

14. The system of claim 11, wherein said loop comprises a pump.

15. The system of claim 1, further comprising a sample loop of predetermined fixed volume, to be filled with sample to be analyzed before supply of said sample to said cell.

16. The system of claim 1, wherein said cell is connected in a liquid loop, comprising a pump connecting inlet and outlet ports of said cell, whereby an aqueous

sample can be recirculated through said cell until oxidation is complete.

17. The system of claim 1, wherein said power supply is such that a low-energy, non-equilibrium plasma is established within said cell.

18. A method for measuring the total organic carbon content (TOC) of a sample of water, comprising the steps of:

providing a plasma oxidation device, comprising a cell capable of containing a plasma, having opposed electrodes on opposed sides of said cell, and defining at least one inlet port and an interior volume;

admitting said sample of water to said interior volume of said cell;

admitting a quantity of a CO<sub>2</sub>-free oxidant gas to said interior volume of said cell;

applying a high-frequency, high-voltage signal across said electrodes, so as to cause a plasma to form across said electrodes, and TOC in said sample to be oxidized to CO<sub>2</sub>; and

determining the amount of CO<sub>2</sub> thus formed.

19. The method of claim 18, where said step of determining the amount of CO<sub>2</sub> thus formed is performed using Fourier-transform infrared (FTIR) spectroscopic techniques.

20. The method of claim 18, where said step of determining the amount of CO<sub>2</sub>thus formed is performed using non-dispersive infrared (NDIR) techniques.

21. The method of claim 18, where said step of determining the amount of CO<sub>2</sub>thus formed is performed using conductivity-based techniques.

22. The method of claim 18, wherein said oxidant gas and said sample are mixed external to said cell.

23. The method of claim 18, wherein said oxidant gas and said sample are admitted to said cell by separate inlet ports, whereby they are mixed internal to said cell.

24. The method of claim 18, wherein said oxidant gas is air having had any CO<sub>2</sub> removed therefrom.

25. The method of claim 18, comprising the further steps of defining a closed loop including said cell and the instrument employed for said step of determining the amount of CO<sub>2</sub> produced, and transferring the result of oxidation of carbon in said sample repeatedly therebetween while monitoring the amount of CO<sub>2</sub> in said sample, until said monitoring step indicates that the oxidation of carbon in said sample has been completed.

26. The method of claim 25, comprising the further step of defining a second liquid loop comprising a pump connected between inlet and outlet ports of said cell, and recirculating an aqueous sample through said cell repeatedly, so as to ensure complete oxidation.

27. The method of claim 18, wherein said power supplied is such that said plasma is a low-energy, non-equilibrium plasma.

28. A method for measuring the total inorganic carbon content (TIC) of a sample of water, comprising the steps of:

providing a plasma oxidation device, comprising a cell transparent to plasma, having opposed electrodes on opposed sides of said cell, and defining at least one inlet port and an interior volume;

admitting a quantity of CO<sub>2</sub>-free air to said interior volume of said cell;

applying a high-frequency, high-voltage signal across said electrodes, so as to cause a plasma to form across

said electrodes, and  $N_2$  in said air to be oxidized to NO and  $NO_2$ ;

mixing said NO and  $NO_2$ -containing air with water, forming  $HNO_2$  and  $HNO_3$  in said water;

mixing said sample with said  $HNO_2$  and  $HNO_3$ -containing water, causing TIC in said sample to be liberated as  $CO_2$ ; and

determining the amount of  $CO_2$  thus liberated.

29. The method of claim 28, wherein said step of determining the amount of  $CO_2$  thus liberated is performed using Fourier-transform infrared (FTIR) spectroscopic techniques.

30. The method of claim 28, wherein said step of determining the amount of  $CO_2$  thus liberated is performed using non-dispersive infrared (NDIR) techniques.

31. The method of claim 28, wherein said step of determining the amount of  $CO_2$  thus liberated is performed using conductivity-based techniques.

32. The method of claim 28, where after the amount of TIC is measured, the total organic carbon content (TOC) of said sample is measured by performance of the following additional steps:

admitting said sample of water to said interior volume of said plasma oxidation cell;

admitting a quantity of a  $CO_2$ -free oxidant gas to said interior volume of said cell;

applying a high-frequency, high-voltage signal across said electrodes, so as to cause a plasma to form across said electrodes, and TOC in said sample to be oxidized to  $CO_2$ ; and

determining the amount of  $CO_2$  thus formed.

33. The method of claim 32, wherein said plasma is a low-energy, non-equilibrium plasma.